

CLAIM AMENDMENTS:

Claim 1 (Currently Amended): A process for fabricating a high density multi-layer microcoil comprising steps of:

providing a substrate;

using photolithography process to form a dry film photoresist structure with a coil tunnel having coil elements perpendicular to said substrate and two outlets at ends of said tunnel; and

injecting a conductive material with low melting point into said tunnel and forming a coil winding,

wherein said steps of forming said photoresist structure depend on number of windings in each coil element; for a coil element with N windings, said windings are numbered as 1 to N from inner to outer; each coil winding is composed of a top parallel portion, a bottom parallel portion and two vertical portions and formed as a planar coil element perpendicular to said substrate; said photoresist structure is made by $4N+1$ times of deposition, comprising steps of:

depositing first to $2N$ th photoresist materials, using photolithography to form said lower half portions of said 1 to N windings of said coil elements; said lower half portions comprises bottom parallel portions and lower halves of vertical portions;

depositing $2N+1$ to $4N$ th photoresist materials, using photolithography process to form said upper half portions of said N to 1 windings of said coil

elements; said upper half portions comprises upper halves of vertical portions and top parallel portions; and

depositing last (4N+1) photoresist material, using photolithography to form a top of said photoresist structure.

Claim 2 (Canceled).

Claim 3 (Currently Amended): A The process for fabricating a high density multi-layer microcoil according to claim 1, ~~claim 2~~ wherein said dry film photoresist is chosen from high strength materials.

Claim 4 (Canceled).

Claim 5 (Previously Presented): A process for fabricating a high density multi-layer microcoil comprising steps of:

providing a substrate;

using photolithography process to form a dry film photoresist structure for a lower half coil tunnel;

depositing an insulation layer on top of said lower half coil tunnel;

using photolithography process to form a magnetic core on said insulation layer and in center portion of said photoresist structure;

removing said insulation layer;

using photolithography process to form a dry film photoresist structure for an upper half coil tunnel, which covers said magnetic core, and forms a coil tunnel having coil elements perpendicular to said substrate and two outlets at ends of said tunnel; and

injecting a conductive material with low melting point into said tunnel and forming a coil winding.

Claim 6 (Currently Amended): A The process for fabricating a high density multi-layer microcoil according to claim 5 wherein said steps of forming said photoresist structure of lower and upper half coil tunnels depend on number of windings in each coil element; for a coil element with N windings, said windings are numbered as 1 to N from inner to outer; each coil winding is composed of a top parallel portion, a bottom parallel portion and two vertical portions and formed as a planar coil element perpendicular to said substrate; said photoresist structure is made by $4N+1$ times of deposition, comprising steps of:

depositing first to $2N$ th photoresist materials, using photolithography to form said lower half portions of said 1 to N windings of said coil elements; said lower half portions comprises bottom parallel portions and lower halves of vertical portions;

depositing $2N+1$ to $4N$ th photoresist materials, using photolithography process to form said upper half portions of said N to 1 windings of said coil

elements; said upper half portions comprises upper halves of vertical portions and top parallel portions; and

depositing last $(4N+1)$ photoresist material, using photolithography to form a top of said photoresist structure.

Claim 7 (Currently Amended): A The process for fabricating a high density multi-layer microcoil according to claim 6 wherein said dry film photoresist is chosen from high strength materials.

Claim 8 (Canceled).

Claim 9 (Currently Amended): A The process for fabricating a high density multi-layer microcoil according to claim 5 wherein said magnetic core is made of high magnetic permeability materials.

Claim 10 (Currently Amended): A The process for fabricating a high density multi-layer microcoil according to claim 5 wherein said magnetic core is made of materials chosen from silicon dioxide and silicon nitride.